

EPA Commentary on the Peer Review

The City of New York and the NYC School Construction Authority (SCA) have developed a Preferred Citywide Remedy to address PCB exposures in the school environment. EPA provided the summary remedy to a panel of peer reviewers along with a series of charge questions. The peer review responses to the charge questions, EPA Region 2 and EPA ORD commentary are summarized below. The summary is divided into three parts. Part 1 of the summary relates to the summary report as a whole. Part 2 is focused on the specifics of the Preferred Citywide Remedy. The summaries in Parts 1 and 2 were prepared by EPA Region 2. Part 3 is an appendix containing ORD comments on the peer review results. The summary is a working draft that will be revised as EPA considers public comments on the Preferred Citywide Remedy and the advice provided by the peer reviewers. The peer review report itself is a separate document available at: (add link to posted document) and contains the entirety of the peer review comments.

Part 1 Summary Report

Charge Question 1: *Does the Summary Report dated May 24, 2013 clearly and comprehensively describe the sources, environmental levels, and potential exposures for PCBs in school buildings?*

Reviewers #1 and #3 believe that the report is written relatively clearly but needs better organization and formatting. Reviewer #2 does not believe that the report is clear and asserts that it attempts to describe the sources, environmental levels, and potential exposures for PCBs in school buildings by referencing an EPA ORD report.

Charge Question 2: *Please comment on the appropriateness of the remedies selected. Do they provide adequate reductions of the exposure to PCBs? If not, do you have suggestions for additional reductions that could be achieved, given the available data?*

Peer Reviewer's Summary: Reviewers #1 and #2 consider the remedies appropriate but recommend that additional measures be considered (e.g. decontamination/treatment of the substrate or a hybrid approach between source modification and contact encapsulation). Reviewer #3 responds that more information is needed to answer the question.

Charge Question 3: *For each remedy: Does the remedy provide sufficient information to reasonably demonstrate the effectiveness of the proposed remedy? If not, what additional information is needed?*

Peer Reviewer's Summary: All three reviewers have concerns with one or more of the remedial alternatives. Reviewer #2 only responds for the ballast re-occupancy protocol and the BMPs.

Charge Question 4: *For each remedy: Are the methodologies used consistent with the state-of-science? If not, please provide specific references and suggestions for revision.*

Peer Reviewer's Summary : Reviewer #2 believes that the methodologies are consistent with the state-of-science. Reviewers #1 and #3 cite deficiencies in the City's approach in determining cause and effect relationships.

Charge Question 5: *Do you have specific recommendations for clarification, explanation, or analysis of data, results, conclusions or other information included in this report?*

Peer Reviewer's Summary: Each reviewer has different recommendations. Reviewer #1 recommends the inclusion of prioritization components to focus the remedy within each school. Reviewer #2 would like to see concise data summary tables in the report. Reviewer #3 recommends that the report provide information on the amount of interior PCB caulk in each school, and also clarify the PCB exposure benchmarks used to evaluate the success of the remedies.

EPA Commentary: Comments made by the peer reviewers specific to the Preferred Citywide Remedy will be addressed in the next section. Although each peer reviewer has reservations about specific portions of the Preferred Citywide Remedy report the report is considered to be comprehensive, appropriate methodology was used in the investigation and the remedies suggested appropriate, although not in all instances, demonstrable effectiveness.

Part 2 Preferred Citywide Remedy Specific Questions

The summary remedy below has been extracted from the Summary Report dated May 24, 2013. It is annotated with the EPA peer review charge questions, a summary of the peer review responses and an EPA R2 commentary on the summary remedy. The EPA commentary will be revised as necessary when public comments are received. The format followed is:

- Summary Preferred Citywide Remedy (NYC Preferred Remedy bulleted and in bold type)
- Peer review charge questions (italic type) and peer reviewers' summary responses (bulleted)
- EPA commentary (as identified)

The elements of the proposed Preferred Citywide Remedy include:

- **NYC Preferred Remedy - PCB Ballast and Associated Light Fixture Management and Replacement - The City will continue to implement its ongoing program whereby all light fixtures that use or used PCB ballasts and associated light fixtures in New York City public school buildings are removed and replaced on a prioritized basis. All light fixture replacements projects will be completed by December 31, 2016.**

Charge Question: *No specific questions related to this portion. The timeframe is the result of a court settlement.*

EPA Commentary: Although the purpose of the pilot was to study means of dealing with caulk significant reductions of PCBs in air were achieved by removal of light fixtures. This portion of

the preferred remedy will result in a reduction of childhood exposure to PCBs and should also result in substantial reductions in energy consumption. EPA encourages removal of light fixtures as quickly as possible. However, in some pilot schools levels of PCBs in air measured after the removal of light fixtures remain above the EPA exposure guidelines. The reasons for this should be investigated further.

- **NYC Preferred Remedy: Interim Visual Inspection and PCB Response Action Program:** The City will also continue its program whereby T12 lighting fixtures (which may contain PCB ballasts) are inspected on a regular basis by custodial staff for evidence of brownish black residue on any of the following: light diffuser (lens), light housing, or any area directly below lighting fixtures (furniture or floor). If leaks are observed, the fixture and the intact ballast or the ballast alone (if only the ballast has PCBs and there are no stains on the fixture) is removed by an electrician. Finally, procedures are in place and will continue to be implemented for the limited cases when PCB ballast leakage occurs outside the fixture (housing or diffuser) or when smoke is emitted from ballasts. This procedure includes the expedited removal of the ballasts and/or fixtures, aggressive ventilation, and cleaning or removal and disposal of any additional impacted items, with confirmatory wipe sampling for PCBs. Both protocols are annexed hereto and would be interim components of the preferred remedy.

Charge Question 6a: *Are there alternatives to the visual inspection protocol for detecting ballasts that have leaked?*

- Peer Reviewers' Summary: Each reviewer provides a different alternative (i.e., open the fixture, detect by odor, perform air testing). See Peer Review Report for full details.

EPA Commentary: We are currently aware of four methods for detecting leaks other than exterior visual inspection.

- 1) The light fixtures could be disassembled for internal inspection. This procedure was used by EPA to conduct a series of inspections in NYC schools. This will reveal leaks (past or present) concealed by the fixture.
- 2) Pendant or surface mount fixtures can be scanned with an infrared (IR) temperature gun to identify ballasts that are operating at elevated temperatures. EPA used this method while conducting inspections in NYC schools. This works especially well for fixtures where the ballast cover is directly visible from below the fixture.
- 3) Air sampling for PCBs could be performed. Based on current experience, levels above ambient background will be common and the light fixtures will have to be disassembled and additional material sampling and analysis performed to confirm whether ballast leakage, caulk or secondary contamination is the source.
- 4) The liquid discharges, smoke and odor from decomposing ballast components is a sign of leakage.

The first three processes will be time consuming and result in duplication of disassembly steps that will have to be performed as part of the light fixture replacement process. Detection of

visible liquid leaks, smoke and/or odor (the current practice) will result in exposures to PCBs and products of combustion until all fixtures are replaced. In light of the December 2016 end date of the present schedule for replacing all of the light fixtures in NYC schools a parallel leak detection effort will be counterproductive. If there were no removal schedule or a longer duration removal schedule in effect we believe pendant or surface mount fixtures could be prioritized for evaluation for leaks by temperature scans.

Charge Question 6b: *EPA has suggested revising the Re-occupancy protocol to include post clean up air sampling in addition to the current practice of surface wipe sampling for PCBs. Is wipe sampling alone adequate to minimize exposure of students and staff to PCBs.*

- Peer Reviewers' Summary: Peer Reviewers' Summary: None of the reviewers believe wipe sampling alone is appropriate. Reviewers #2 and #3 recommend air sampling while Reviewer #1 believes that rooms where leaks have occurred should be prioritized for ventilation assessment.

EPA Commentary: When a ballast failure results in a sudden release of PCB liquids a large amount of PCBs can be released in a small period of time. Literature data and samples collected in the NYC schools indicate that such releases can result in levels of PCBs in air far in excess of EPA guidelines and that elevated levels may persist for extended periods of time. EPA research also indicates that the PCBs released can be absorbed by other materials in the classroom. NYC and EPA have devised a re-occupancy protocol that is based on standard industrial hygiene clearance calculations to minimize the immediate impact of sudden PCB releases from ballasts. We have discussed with NYC verification of the adequacy of these procedures by collecting air samples. NYC believes the presence of other sources of PCBs such as caulk and contaminated secondary materials will confound results. EPA does not believe that caulk and secondary sources will confound the result we are seeking to verify (i.e., has the clearance procedure rapidly reduced PCB in air levels in the room). Modeling and existing measurements indicate levels in school spaces are almost invariably below 1000 ng/m³. The values in a room after a release could be very high (above 10,000 ng/m³). We believe sampling is necessary in a limited number of rooms to validate the procedures established and to ensure that they rapidly reduce PCBs in air levels to a level that is no worse than elsewhere in the school.

The wipe sampling that is part of the protocol is only useful in those cases where a leak of known or suspected liquids outside of the fixture has been identified. The wipe sampling clearance level specified in the TSCA regulations is technology rather than risk based. In those instances where a visible liquid leak has been identified it serves the purpose of demonstrating the area directly impacted by the leak has been decontaminated to the extent required by the TSCA regulations.

Charge Question 6c: *If sampling for PCBs in air is it possible to achieve a low enough detection limit (detection limit at least 50ng/m³) using a passive sampler?*

- Peer Reviewers' Summary: None of the reviewers could provide a definitive answer to this question.

EPA Commentary: EPA believes passive sampling would provide an alternative to the conventional dynamic air sampling. It had several advantages:

- It is more sensitive than the dynamic air sampling method because the passive sampler collects integrated air samples over a long period of time (e.g., 4 weeks)
- It is less costly and less labor intensive
- It reflects the average concentrations over a long period of time
- If passive samplers are used before and after the mitigation, the ratio of the two samples is a good indicator for the mitigation effectiveness

A calibration process would be necessary to implement this technique. Once completed it would allow air monitoring to be carried out on a wider scale at a lower cost.

- **NYC Preferred Remedy: Continued Assessment with EPA on Potential Caulk Remedial Measures:** While the measures thus far evaluated in the Pilot Study have yet to yield an effective remedy for PCB caulk, the work performed during the pilot study has yielded invaluable data and information on potential remedial measures designed to address this complex issue. As part of the preferred remedy, the City would like to continue this work under EPA's oversight by performing evaluations of new remedial approaches for PCB caulk. The City would perform this work in schools where fixtures containing PCB light ballasts have already been removed.

Charge Question 6d: *The approaches evaluated thus far include patch and repair, removal and encapsulation. Are there other approaches that may be evaluated?*

- **Peer Reviewers' Summary:** Reviewer #1 recommends evaluation of secondary barriers or substrate treatment. Reviewer #2 believes lowering the amount of PCBs in caulk through chemical degradation and covering the caulk with an impermeable sealant should be evaluated. Reviewer #3 recommends a barrier such as polyethylene tape as part of an encapsulation remedy, while gypsum board and aluminum strips could be also used in schools as barriers.

EPA Commentary: None of the approaches to caulk remediation evaluated by NYC appear to have a discernible impact on PCBs in air levels. The evaluations of caulk remedies done so far may be compromised by two factors that were not known when the pilots were designed.

1. The emissions from secondary materials that have absorbed PCBs released from ballasts and caulk continue after ballasts and caulk are removed or encapsulated.
2. The caulk that is accessible on the surface of the building is an unknown fraction of all caulk within the building. A review of building sealant guides indicates that sealants are applied in a wide variety of inaccessible locations in modern building construction. Although these locations are not physically accessible, air flow from and through the inaccessible spaces to occupied spaces does occur. This was demonstrated by the tracer gas studies conducted in 199M. If the quantity of inaccessible caulk is large in comparison to surficial caulk; the removal or encapsulation of surficial caulk may have little impact on PCBs in air levels.

A way of reducing this uncertainty would be to compare the impact of ballast removal in schools with and without PCB containing caulk. Schools with planned light fixture removals should be surveyed to determine whether they contain caulk with elevated levels of PCBs. A group of schools with and without PCB containing caulk should be selected, pre-removal air levels measured, the lights removed and post removal air levels measured. If schools that have PCB caulk but never had PCB containing light fixtures could be located we could better define the relative contributions of caulk and light fixtures to PCBs in air. Although EPA believes passive sampling is less costly than dynamic sampling; either could be used for before and after measurements. Sampling at intervals after the light fixture removal would be the means of evaluating the contribution of PCB emissions from secondary sources. This would also require that NYC continues to monitor PCBs in air levels in the current pilot schools (which contain sealants) to determine if equilibrium levels meeting EPA guidelines can be reached. An active metal treatment system for PCB decontamination (AMTS) devised by NASA was evaluated by EPA. The system is capable of decontaminating thin layers of PCB contaminated material and of decontaminating PCBs that have been absorbed in surface layers of masonry adjoining PCB caulk. EPA believes that it may be developed further to allow decontamination of thicker layers of material and masonry. If contaminated surficial masonry rather than inaccessible sealants are a major contributor to PCBs in air the barrier approaches suggested by the peer reviewers and decontamination with AMTS may be a way of dealing with the problem. A further pilot effort would be needed to demonstrate the effectiveness of either approach.

- **NYC Preferred Remedy: Best Management Practices: The Best Management Practices (BMP), as approved by EPA in April 2012, will be implemented. This includes employing strategies for managing PCB caulk and ensuring safe and proper operation of all heating, air conditioning, ventilating and similar equipment (collectively "HVAC").**

PCB caulk Management- Measures and practices will be used to protect interior and exterior PCB caulk from accidental damage and to identify the potential for deterioration through routine inspections requiring further action on an ongoing basis during school maintenance, repair and renovation. The BMPs also reference remediation of deteriorated PCB caulk by removal and replacement, patch and repair, or encapsulation.

Charge Question 6e: Should the caulk management plan address both deteriorated and intact caulk, or should it focus on only one condition of caulk?

- Peer Reviewers' Summary: Reviewer #1 believes that the City should prioritize addressing the intact caulk based on concentration and accessibility. Reviewer #2 suggests including both deteriorated and intact caulk with an emphasis on deteriorated caulk. Reviewer #3 suggests focusing on all forms of caulk that contain PCBs at levels exceeding 10,000 parts per million.

EPA Commentary: The contribution of caulk to PCBs in air exposure has not been quantified. We have not noted deterioration of caulk inside any of the pilot schools (except deterioration due to physical abuse). We believe the measure proposed above has value should there be a

need to address caulk that may have deteriorated. However we have not noted significant areas of deteriorated caulk in the pilot schools. Research indicates that emissions from intact caulk containing high levels of PCBs can lead to increased indoor air PCB concentrations. We believe further investigation is necessary to determine if this is a problem in NYC schools.

One of the reviewers has suggested detecting PCB containing caulk by using an X-Ray Fluorescence (XRF) spectrometer. This approach should be explored as XRF surveys could be conducted at a small fraction of the cost of a survey done with standard analytical techniques.

- **NYC Preferred Remedy: Heating Ventilating and Air Conditioning Maintenance**
Building Air exchange rates will be maintained per design by ensuring that the HVAC and general ventilation systems are operating properly in accordance with the requirements contained in Appendix F of the Collective Bargaining Agreement. HVAC and general ventilation supply and exhaust fans will be operated while schools are occupied. Heating stacks, where designed primarily for ventilation rather than heating, shall be used to provide tempered fresh air while buildings are occupied. The City will maintain, adjust and make minor repairs to systems as needed. If there are problems identified with the systems that are beyond the ability of the appropriate building staff to directly rectify, a work request will be submitted on an expedited priority of a time sensitive nature.

Charge Question 6f: *The school buildings have been constructed over a period of more than a hundred years and many have been modified during the course of their operation. Air exchange rates under current operating conditions are unknown. Are there procedures, in addition to those specified in the collective bargaining agreement, which would minimize the impact of PCB releases?*

- **Peer Reviewers' Summary:** All three reviewers discuss the assessment/optimization of ventilation and recommend that ventilation be optimized to minimize levels of PCBs in air.

EPA Commentary: Data collected in PS199, PS309 and PS178 indicate that the air handling systems in these schools were no longer functioning as designed. A review of the mechanical system evaluations for the schools that had lighting ballasts removed this summer indicates that mechanical systems that are not fully functional are common. The degraded function in PS199, PS309 and PS178 may have been a consequence both of physical deterioration of the mechanical components of the ventilation systems and reduced infiltration due to window replacement.

If there is a PCBs in air problem remaining after light fixture removal enhanced ventilation improvement needs to be considered in conjunction with and as an alternative to caulk removal, as improved ventilation carries with it benefits other than reduced exposure to PCBs and removal of all caulk and decontamination of all contaminated building surfaces may be impossible unless the building is demolished.

- **NYC Preferred Remedy: Removal, Replacement and Encapsulation of Caulk** - As presented in the BMP, capital projects to renovate schools will be performed by the New York City School Construction Authority (SCA) in accordance with standard construction specifications which have been developed to properly manage and dispose of PCB caulk when it is disturbed during renovation activities. These protocols require rigorous dust control measures during the work followed by cleaning and inspection at the conclusion of every work shift to minimize the potential exposure to PCB-containing dust during construction.

Charge Question 6g: *The proposal is to remove, replace and/or encapsulate caulk if disturbed during the course of routine construction projects. Would proactively addressing the presence of PCBs city-wide, regardless of future construction, significantly reduce exposures? If so what factors are recommended for consideration in identifying buildings that should be prioritized for caulk management activities (e.g., schools with passive ventilation systems, schools with children under 6, Etc.)?*

- **Peer Reviewers' Summary:** All three reviewers believe that proactively addressing PCBs would significantly reduce exposure. Reviewer #1 recommends a stabilization approach where potential exposures are controlled through assessment or interim measures (i.e., best management practices) until a time that PCB caulk removals can take place. Reviewer #2 discusses prioritization based on the type of ventilation, estimated number of PCB-containing ballasts and frequency of ballast burnout, estimated linear feet of PCB-containing caulk (interior and exterior), PCB concentration in the caulk, and condition of the caulk. Reviewer #3 recommends considering the type of construction, amount of interior caulk, type of ventilation system, and information on energy intensity for heating and cooling.

Charge Question 6h: *Would air sampling be an effective means of confirming a recommended prioritization scheme?*

- **Peer Reviewers' Summary:** All three reviewers believe air sampling would be an effective means of confirming a prioritization scheme.

EPA Commentary 6g&h: Efforts to remove, replace or encapsulate caulk have had limited success in reducing levels of PCBs in air. Emissions from secondary sources, inaccessible PCB containing caulk or the inefficacy of caulk control efforts may all contribute to the failure to observe reductions from caulk removal or encapsulation.

As described above, we suggest air sampling in a number of additional schools in an attempt to shed further light on what combination of fixture replacement, caulk removal and ventilation improvements is most effective. Such a sampling program would do much to inform the course to follow on a national scale. However such an effort might take several years to design and implement. The quickest way of prioritizing further action in NYC would be to sample for PCBs in air. In particular, schools where SCA mechanical equipment surveys have documented air handling deficiencies would be tested after light fixture removal to determine if EPA PCBs in air guidance levels are exceeded. Those with exceedances would be prioritized for ventilation

improvements. Such a course of action would not resolve the issue of the optimum resolution to the PCB containing caulks problem but would reduce exposure for the population that would probably be exposed to the most PCBs.

- **NYC Preferred Remedy: Soil Evaluation, Excavation and Replacement - SCA will evaluate the presence of PCBs in the surface soil within outside exposure areas (i.e., soil within ten feet of the building face), following the completion of construction projects that disturb exterior PCB caulk. Any surface soil within ten feet of the building found to contain PCBs at a concentration of greater than the 1 ppm guidance value will be the subject of remediation by excavation and off-site disposal. Confirmatory post-excavation soil results will be obtained. After removing contaminated soil, the excavation will be backfilled using clean fill.**

***Charge Question 6i:** The proposal is to evaluate soil for the presence of PCB following construction projects that might disturb exterior caulk. Would proactively evaluating the presence of PCBs in the soil at all schools with exterior PCB caulk, regardless of future construction, significantly reduce exposures?*

- Peer Reviewers' Summary: The reviewers do not believe that proactively evaluating PCBs in the soil will significantly reduce exposure.

EPA Commentary: The EPA exposure assessment indicates that exposure to PCBs in soil is likely to be considerably lower than exposures to PCBs in air inside the schools. We believe that evaluation of the presence of PCBs in soil should be prioritized in the areas used for activities that result in routine contact with soil, i.e. a play area; or if there is construction or other activity that may have disturbed PCBs containing caulk or if the caulk is visibly deteriorating.

- **NYC Preferred Remedy: Public Outreach: The City will implement public outreach pursuant to Local Laws 68 and Local Laws 69 of 2011 (see Appendix A). In addition, the City shall continue to maintain its updated website, which provides email updates to those who request such notices. The website will, among other things, provide information on the City's progress to remove PCB light fixtures.**

***Charge Question:** No specific questions related to this portion. These are terms of the CAFO.*

- **NYC Preferred Remedy: Finally, due to existing limitations and data gaps associated with managing PCBs in school buildings additional studies are recommended in the areas of long-term monitoring, encapsulation of caulk and substrate, and activated carbon air filtration. It is anticipated that the proposed approach to managing PCBs in the schools will be subject to change based on future data collection and data evaluation.**

***Charge Question 6j:** Do the reviewers perceive data gaps or limitations not identified by NYC?*

- Peer Reviewers' Summary: Each reviewer provides a different response to the question. Reviewer #1 recommends focusing on a stabilization approach until a final

remedy can be implemented at each school. Reviewer #2 proposes an evaluation of the hybrid approach of source modification plus contact encapsulation. Reviewer #3 recommends performing an analysis of the value of information gained from any additional studies, and discussing why the Preferred Citywide Remedy does not include air sampling.

EPA Commentary: As discussed above, the pilot plan was designed to evaluate the impact of caulk remediation. Evaluation of the data collected thus far indicates that PCBs released to air is the most significant exposure route and that light fixture removal appears to have a significant impact on this pathway. Due to the small number of schools in the pilot and the unexpectedly large effect of PCB emissions from light fixture the data collected does not appear to be adequate to allow us to understand the impacts of emissions from secondary sources and releases from inaccessible PCB containing caulk. As noted above, EPA proposes that further sampling be conducted to more fully evaluate the contribution of PCB containing caulks and secondary contaminated materials.

Part 3 EPA ORD Comments on Peer Review

Zhishi Guo

1. **Overall.** This peer review is of good quality. The three reviewers are true experts in the pertinent fields. Their comments are professional and highly relevant.

2. **Deteriorating caulk vs. intact caulk.** The reviewers had somewhat different views on whether NYC should focus more on deteriorating caulk as oppose to intact caulk. I think it is a mistake to emphasize deteriorating caulk. It was our observation that caulk with very high levels of PCBs tends to remain flexible and look like new. Thus, emphasizing deteriorating caulk may miss some important sources. It is a good idea to survey all potential sources with a hand-held XRF, which can detect chlorine.

3. **Static air sampling.** Everybody acknowledges the difficulties in taking air samples in occupied buildings but is reluctant to use the static air sampling method. I think static air sampling provides an alternative to the conventional dynamic air sampling. It had several advantages:

- It is more sensitive than the dynamic air sampling method because the former collects integrated air samples over a long period of time (e.g., 4 weeks)
- It is less costly and less labor intensive
- It reflects the average concentrations over a long period of time
- If static samplers are used before and after the mitigation, the ratio of the two samples is a good indicator for the mitigation effectiveness

During the lab studies, we used the polyurethane foam disks to monitor PCB concentrations in lab air. It worked well. The only disadvantage of static air sampling is the uncertainty in the deposition velocities for PCBs. However, the range of deposition velocity inside buildings are much narrower than that in the ambient air. Furthermore, this problem can be resolved by a combination of the following measures: (1) Conduct a “calibration study” in typical class rooms in NYC to experimentally determine the deposition velocities; and (2) All parties form technical panel to agree on a set of deposition velocities for PCBs in NYC schools.

Although most people believe that dynamic air sampling is more accurate than static sampling, I think the former has disadvantages. For one, dynamic air sampling is sensitive to the indoor environmental conditions (e.g., temperature and ventilation rate) DURING the sampling period. Consequently, a limited number of air samples may not be representative of the long-term average concentrations.

4. **Encapsulating caulk.** We did not recommend encapsulating caulk with liquid encapsulants out of concerns over PCB bleed-back. A couple of reviewers recommended using a secondary barrier (e.g., polyethylene or metal tapes) between caulk and liquid encapsulant (e.g., epoxy). As an interim measure, I think it is worth trying.

5. Solvent for wipe sampling. One reviewer indicated that hexane is not a good solvent for wipe sampling of PCBs. I agree. In our encapsulation study we used isopropanol.

Kent Thomas

Review of the technical adequacy of peer review comments received by Region 2 in response to the Report on PCB Caulk in New York City School Buildings.

The peer review responses appeared to be, in general, of good technical quality. They addressed the charge questions and demonstrated knowledge of the technical and scientific issues around the problem of assessing and mitigating exposures to PCBs in school buildings.

Q2, Q3, Q4. Different approaches for addressing PCBs in caulk were discussed by reviewers, including removal, in-situ chemical degradation, and encapsulation. It is not clear that an effective approach has been demonstrated at this time for either in-situ chemical degradation or encapsulation for caulks containing high concentrations of PCBs. Some work has shown at least initial effectiveness for the use of impermeable barriers. These could be areas considered for additional research.

Q3 & Q6e. There were differing views among the reviewers regarding whether addressing deteriorated or deteriorating caulk should be a higher precedence as compared to relatively intact caulk. Research suggests that caulk containing the highest levels of PCBs was generally still flexible and largely intact, and that caulk containing PCBs at 1% to 40% levels are likely to emit substantial amounts of PCBs into the air, and to contaminate adjoining materials. Thus, it seems that any management plan would need an approach to identify caulk and other sealants with high PCB levels, rather than just focusing on deteriorated caulks that may or may not contain high levels of PCBs.

Q5 & Q6e. One reviewer suggests using portable x-ray fluorescence (XRF) devices to screen for PCBs in caulk using chlorine as the target element. This approach holds great promise, but there is very little published information available demonstrating its validity for this specific purpose. This might be one area for additional research - to test and evaluate the specificity and sensitivity of one or more portable XRF devices as a screening method for in-situ identification of PCBs in building sealants and other materials.

Q6c. Passive air sampling methods and measurements for PCBs and other persistent organic pollutants in outdoor air have been reported in the literature, particularly using polyurethane foam (PUF) in specially designed partial enclosures. Devices and procedures for indoor air sampling of semi-volatile chemicals are also available. There has been some effort to characterize effective PCB sampling rates for outdoor air samplers; but very little for indoor versions. Air velocity effects, effective particle size sampling rates under differing conditions, and the issues of multiple PCB congeners and different vapor/particle ratios among the congeners under different conditions make it difficult to use passive PUF samplers to obtain quantitative indoor air concentration measurements. There is also the issue that the relevant time to collect air samples is when the school building is operated under its 'occupied'

conditions of temperature and ventilation, but passive samplers would be collecting under both the occupied and unoccupied conditions, making interpretation of measurements with regard to potential exposures more difficult.

6i. A reviewer discusses possible use of a Releasable Asbestos Field Sampler-type approach for in-situ assessment of releasability of PCBs from soil. In my opinion, this approach is problematic and potentially not very useful for PCBs in soil decision-making. Vapor/soil partitioning could be estimated, but with regard to exposures, any dermal contact, ingestion, or inhalation of soil bearing PCBs is likely to lead to exposure/dose. Because of the range of different congeners physical/chemical properties, the range of different soil properties, and lack of congener specific measurements in most assessments, it is my opinion that this approach could require significant effort for minimal return with regard to decision-making.